

ON THE FAMILY DIARTHROPHALLIDAE (ACARINA-MESOSTIGMATA-MONOGYNASPIDA) WITH PARTICULAR REFERENCE TO THE GENUS
PASSALOBIA LOMBARDINI 1926.

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[Read 12 May 1960]

SUMMARY

The family Diarthrophallidae Trägårdh 1946 is discussed and all known genera and species belonging to it considered. Two subfamilies, the Diarthrophallinae comprising the genera *Diarthrophallus* Träg., *Brachytremella* Träg., *Lombardinella* Wom. 1960 and *Brachytremelloides* Wom. 1960, and the Passalobiinae containing the genera *Passalobia* Lomb. 1926 and *Passalana* g. nov. are erected. The genus *Passalobia* Lomb. is redefined and the species *P. duodecimpilosa* Lomb. is removed therefrom as a synonym of *Diarthrophallus similis* Träg. 1946. A new genus *Passalana* is erected for *Passalobia peritrematica* Lomb. 1951.

The subfamilies, genera and all known species are keyed.

The family Diarthrophallidae was erected in 1946 by Trägårdh in his very important paper, "Diarthrophallina, a new group of Mesostigmata, found on Passalid beetles", published in the Ent. Medd., 24 (6), pp. 369-394, 1936.

It was founded upon a study of the curious mite found under the elytra of *Passalus cornutus*, in North Carolina and described by Pearse *et al.* as *Uroscius quercus* n. sp. in Ecol. Monog. 6, pp. 478-479, figs. 31-34.

For the species Trägårdh erected the genus *Diarthrophallus*. The family he placed in a new cohort, the Diarthrophallina, within his subdivision, the Eugynaspida of the Mesostigmata, in which the epigynial shield (sterno-gynial of Camin and Gorirossi, 1955) is developed or if absent then secondarily so. He stressed the relationship of his cohort to the Uropodina and defined the cohort and family as follows:

"Body flat, shield-shaped. Legs very short; legs I without ambulacres, legs II-IV with large ambulacres but no claws. Tritosternum flanked by two praesternal hairs. Mandibles short, chelate. Palpi without bi- or trifurcate bristle on the base of the terminal joint. Peritreme very short. Female epigynial shield large, tongue-shaped, without hairs, not articulated at the base. Metasternal shields fused with the other sternal shields and the ventral shield forming a rim round the genital aperture. Male genital armature consisting of a large, biarticulated penis fitted into a groove and directed backwards.

Typical genus *Diarthrophallus* nov. gen."

In 1955, Drs. Camin and Gorirossi reduced the Diarthrophallina to the rank of a superfamily, the Diarthrophalloidea, and together with the Trachytoidea and Uropodoidea placed it in the cohort Uropodina.

They diagnosed the superfamily thus:

"Epigynial shield elongate, tongue-like, fused or hinged to ventral shield. Metasternal shields fused with sternal shield. Sternal shield independent or fused with ventral to form perigenital ring; enlarged jugulars in some. Base of tritosternum moderate to broad, unconcealed; flanked by a

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pair of 'praesternal' setae. Stigmata between coxae III and IV. One or two dorsal shields without marginal shields. No camerostome or 'fovealae pedales'."

Besides the genotype of *Diarthrophallus*, Trägårdh (loc. cit.) described a second species of the genus, *D. similis* from Mexico, and erected a new genus, *Brachytremella* for a new species *B. spinosa* from New Guinea. He also in the same paper referred to his family the little known genus *Passalobia* Lombardini, 1926.

Through the great kindness of the authorities of the Stockholm Museum and the assistance of Dr. K. H. Försslund of the Swedish Forest Research Station, Stockholm, I have been able to examine the material of *D. quercus* which was sent to Trägårdh by Dr. Pearse for study. In addition, I have received from Dr. D. E. Johnston of the Inst. of Acarology, Univ. of Maryland, U.S.A., a number of slides labelled and identified by him as *D. quercus*. Actually not all of these are this species but as will be shown later some are to be assigned to *D. duodecimpilosa* (Lomb.), which is the same as *D. similis* Träg. I have also a single male and nymph of *D. quercus* which I collected from a Passalid in a rotting log at a saw mill in Annapolis, Maryland, U.S.A., in June 1947.

Inquiries of my friend, Dr. S. L. Tuxen, as to the present existence of the unique female of *Brachytremella spinosa* Träg. from New Guinea have failed to locate it. It seems therefore to be now lost. However, on Passalids which I collected at Bulolo, New Guinea, in 1954, I was fortunate to find a single specimen of each sex and two nymphs which agree with Trägårdh's description. The species is therefore redescribed in this paper.

The third genus which Trägårdh referred to the Diarthrophallidae is the little known *Passalobia* Lomb., 1929. This genus was erected for *P. quadricaudata* from a Passalid from Brazil.

Later Lombardini described three other species as belonging to his genus, namely, *P. duodecimpilosa* 1938, *P. major* 1938, and *P. peritrematica* 1951.

Hitherto, no one but Lombardini has seen material of this genus or even re-examined his material. It is therefore a very great privilege that I have been permitted by Dr. Lombardini to examine what is extant of his *Passalobia* spp. and with his permission to remount them. Unfortunately, the war resulted in the loss of much of his collection and the whole lot still existing and sent to me comprises 1 slide of *P. quadricaudata*, ♂, 1 ditto larva, 2 slides of *major*, nymphs, 1 slide of *duodecimpilosa*, ♀, and 1 slide of *peritrematica*, nymph. Of these species *duodecimpilosa* is considered to be a synonym of and to have priority over *similis* Träg. and not to be a true *Passalobia* but probably a *Diarthrophallus*. For the very curious *P. peritrematica*, a new genus *Passulana* is created. I have therefore been able to study all the described species of Diarthrophallidae while in a concurrent paper to this I have described two new species of *Brachytremella* from Australia, as well as erected the genera *Lombardiniella* and *Brachytremeloides* for two other new species also from Australia.

Family DIARTHROPHALLIDAE Trägårdh.

Trägårdh, J., 1946. Diarthrophallina, a new group of Mesostigmata found on Passalid beetles. Ent. Medd., 24 (6), pp. 369-394.

New Diagnosis.—Body form flat, broadly oval to elongate, sometimes constricted medially. Dorsum with a single shield, generally surrounded by a narrow band of cuticle, with or without a number of long ciliated capitate setae. All legs short, I thin and antennaeform without ambulacra, tarsus apically bifurcate, II-IV much stouter with large ambulacra but no claws; coxae I

coalesced medially to form a single transverse praesternal shield or well differentiated and fragmented. Tritosternum at base flanked by a pair of setae. Sternal, metasternal and ventral shields coalesced, forming a perigenital oval ring between the coxae; sterno-gynial shield in female tongue-shaped fitting the genital orifice and fused posteriorly with the ventral shield, in the male fused anteriorly with the sternal shield and the sterno-gynial shield directed posteriad. Anal shield small, with one pair of long adanal setae. Metapodal shields present or absent. Hypostome with 3 pairs of setae. Tectum bi- or quadrifurcate or helmet-shaped with apical spike. Chelicerae with excrescence on fixed digit. Stigma between coxae II and IV, rarely between II and III, peritreme short or absent and directed anteriorly, or long, free and directed backwards.

Typical genus *Diarthrophallus* Träg.

Subfamily DIARTHROPHALLINAE Trägårdh, 1946

Tectum bi- or trifurcate. Body broadly oval to elongate oval, not medially constricted, dorsally with long ciliated capitate setae or entirely without setae.

Typical genus *Diarthrophallus* Träg.

Genus DIARTHROPHALLUS Träg.

Trägårdh, l., 1946. Ent. Medd., 24 (6), p. 371. Type *Uroscius quercus* Pearse et al., 1936.

Body broadly oval, with long dorsal ciliated capitate setae. Perigenital ring in female closed behind by a well-defined semicircular suture. Tectum a rather elongate cone, apically quadrifurcate with the outer styli simple and strongly bent outwards, the inner styli directed straight forwards closely adjacent and basally with long ciliations. Leg II in male similar to female. . . .

Genotype *Diarthrophallus quercus* (Pearse et al.).

This genus so far contains only two species and seems to be confined to North America. Besides the type Trägårdh, 1946, described a second species *D. similis* from a single nymph found on a specimen of the Passalid *Proculus goryi* from Mexico, in the Hope Museum, Oxford. As is shown later, *similis* is a synonym of Lombardini's *Passalobia duodecimpilosa* 1938 which trivial name has priority.

Diarthrophallus quercus (Pearse et al.).

Text figs. 1A-F, 2A-B.

Uroscius quercus Pearse et al., 1936. Ecol. Monog., 6, p. 478, figs. 31-34.

Diarthrophallus quercus Trägårdh, 1946. Ent. Medd., 24 (6), pp. 371-380, figs. 1-2, 4-5.

Female, Fig. 1A.—A broadly oval, brownish species. Length of idiosoma 526 μ , width 409 μ .

Dorsum.—Almost entirely covered by dorsal shield, only a narrow band of cuticle surrounding shield, length of shield 468 μ , width 398 μ , with 6 pairs of long ciliated capitate setae to 440 μ long, second and fourth pairs of setae marginal on shield, first, third, fifth and sixth pairs on the cuticle, shield with a pair of pores in line with coxae III and a number of fine pores or setae (not shown in Fig. 1B).

Venter, Fig. 1A.—As figured; tritosternum with a moderately long conical base flanked by a pair of setae; sternal, endopodal, metasternal and ventral shields coalesced to form a single shield 394 μ long, 120 μ wide anteriorly, expanding to 216 μ between coxae II and coxae III, then contracting to 130 μ between coxae IV to expand again to 149 μ before rounding off a short distance from anal shield; in the intercoxal portion is the large oval perigenital ring in which lies the close-fitting oval tongue-shaped sternogynial shield, the margin of the orifice is thickened to 134 μ from the anterior and across at this point is

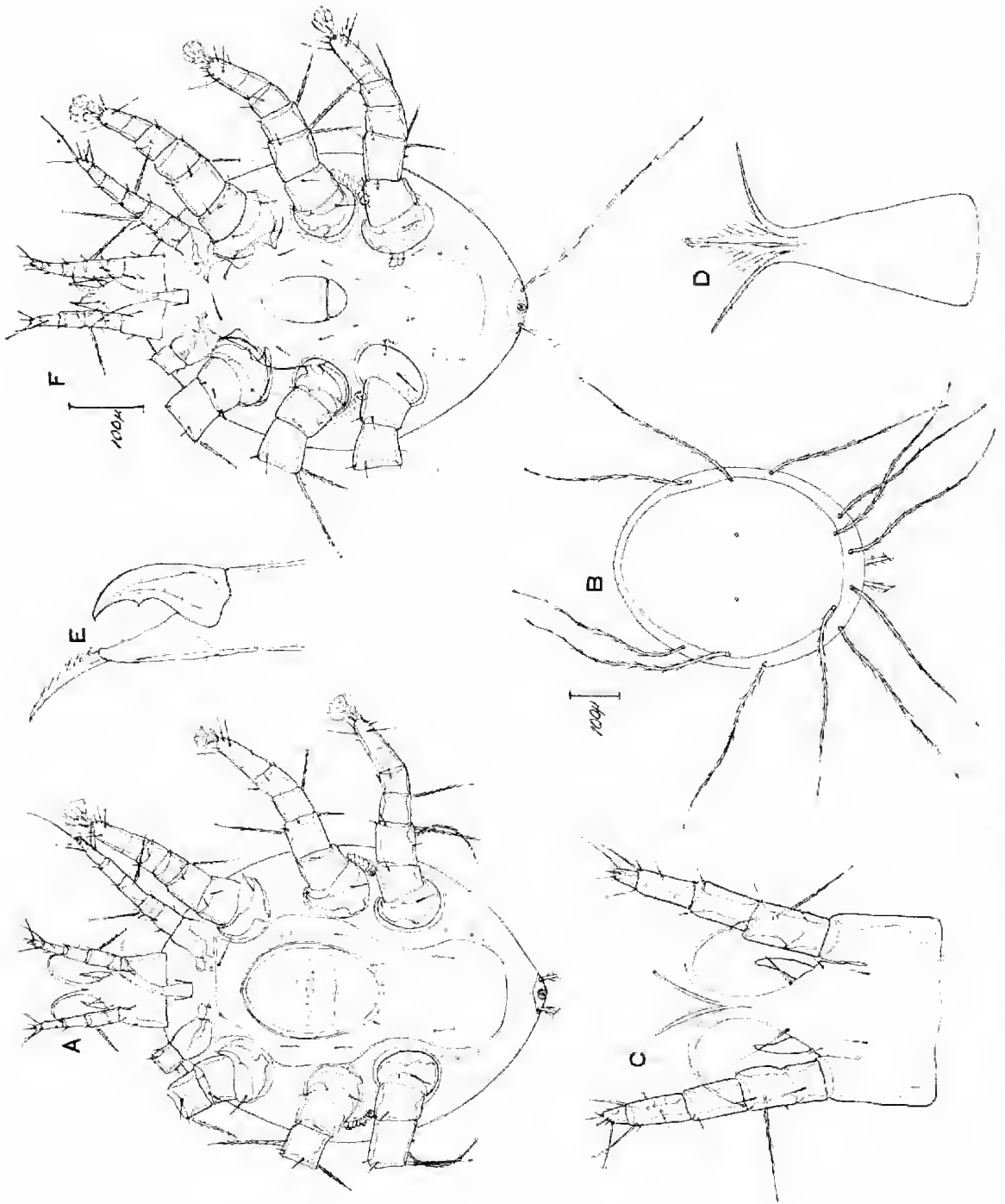


Fig. 1.—*Diarthrophallus quercus* (Pearse et al.). A, female in ventral view; B, dorsal view

a faint sub-cuticular transverse line, the orifice is posteriorly closed by a semi-circular suture, the anterior pair of sternal setae are long, 48μ , the second to fourth pairs 14μ and the fifth pair in line with posterior margin of coxae IV 24μ ; anal shield transversely diamond-shaped, 58μ wide by 20μ , with a pair of long ciliated capitate setae to 440μ ; there are no metapodal shields; on each side of the ventral portion of the sterno-ventral shield are 2 or 3 small shieldlets; stigma between coxae III and IV with a short curved forwardly directed peritreme 48μ long.

Gnathosoma, Fig. 1C.—As figured, with 3 pairs of hypostomal setae of which the anterior pair is the longest, with a pair of strong outwardly curved hypostomal styli and a pair of long salivary styli; dorsally with a long conical tectum,

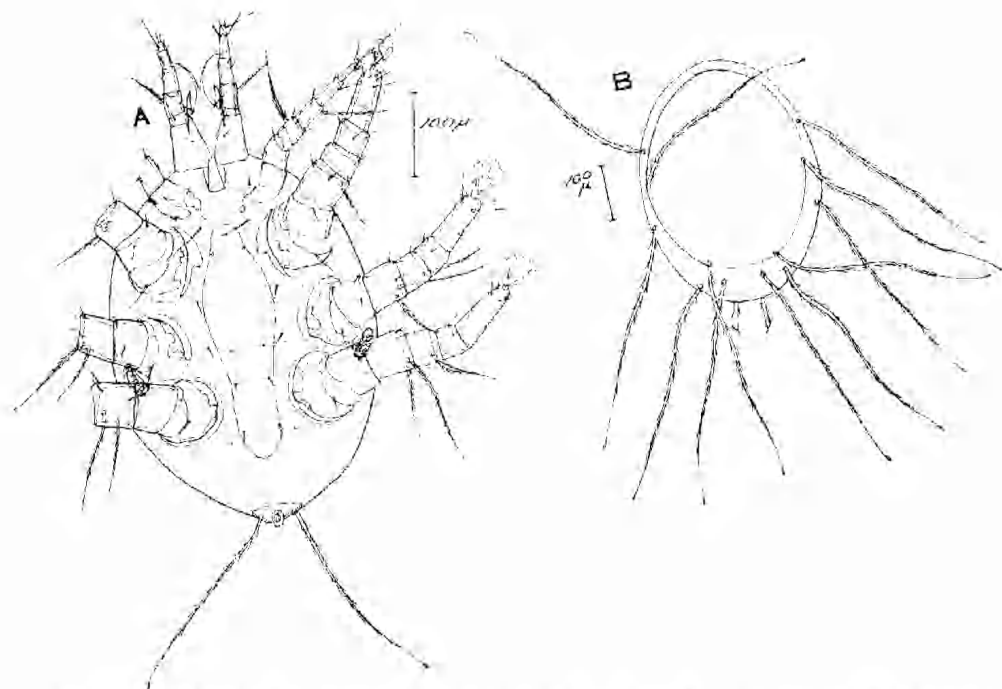


Fig. 2.—*Diarthrophallus quercus* (Pearse et al.). Nymph. A, venter; B, dorsum.

Fig. 1D, with 4 apical branches, the outer ones bent rather sharply outwards and nude, the inner ones about the same length, closely adjacent and directed straight forwards with long ciliations basally. *Palpi* 5-segmented (Fig. 1C), femur with straight long-ciliated seta dorsally. *Chelicerae* (Fig. 1E), fixed digit without teeth but with a subapical excrescence, movable digit with a small median inner tooth.

Legs.—All 6-segmented and shorter than body, I slender and tapering to 216μ , tarsus without ambulacra but apically bifid with a long seta, with a long straight and ciliated seta on femur and on genu, II-IV much stouter and the tarsi furnished with large ambulacra but without claws, II 312μ long with two long ciliated setae on femur and one on genu, III 336μ with similar setae on femur and genu, IV 360μ and similar.

Male, Fig. 1F.—Of the same size and facies as in the female.

Dorsum as in the female.

Venter, Fig. 1F, as in the female but the coalesced sternal, endopodal, meta-sternal and ventral shield somewhat narrower, length 374μ , anterior width 120μ , expanding between coxae II and between coxae III to 178μ , contracting to 101μ between coxae IV and then widening to 120μ before rounding off, the setae are as in the female, between the coxae is the oval perigenital ring which is not as large as in the female, 110μ long by 72μ wide, within it lies the elongate backwardly directed and two-segmented sternognathal shield, 82μ long by 62μ wide, with the apical segment 24μ long, coalesced anteriorly with the sternal shield; the stigma is between coxae III and IV with peritreme 58μ long.

Gnathosoma and *Legs* as in female; leg I 226μ long, II 326μ , III 360μ , IV 384μ .

Tritonymph, Fig. 2A-B.—Of the same general shape as in the female. Length of idiosoma 433μ , width 304μ .

Dorsum, Fig. 2B.—Dorsal shield with 2 pairs of long, 409μ , ciliated capitate setae and surrounding cuticle with 4 pairs of such arranged as in the female.

Venter, Fig. 2A.—With a single shield 283μ long by 82μ wide between coxae II and III, rounded anteriorly and tapering from coxae III to just past the posterior of acetabula IV, between coxae IV it is 53μ wide, of the 5 pairs of sternal setae only IV and V are on the shield, sternal setae I are longer than the others; endopodal shields of coxae I are free and well demarcated, rather moon-shaped as shown; stigma between coxae III and IV with peritreme 29μ long; anal shield as in female, 53μ wide by 19μ long, with adanal pair of long ciliated setae to 336μ .

Gnathosoma as in female.

Legs as in female, I 206μ long, II 288μ , III 298μ , IV 312μ .

Remarks.—The above descriptions and figures are from preparations sent by Dr. D. E. Johnston of specimens from Oakland Co., Michigan, U.S.A., 14/4/57. The female was from slide I-241-1, the male from slide I-241-3 and the nymph from slide I-241-4.

Diarthrophallus duodecimpilosus (Lomb., 1938) new comb.

Fig. 3A-G.

Passalobia duodecimpilosa Lomb., 1938. Mem. Soc. ent. ital. XVII, fasc. I, p. 46, Figs. V and VI.

Diarthrophallus similis Träg., 1946. Ent. Medd., 24 (6), pp. 380-384, Figs. 6 and 7.

Lombardini described this species from a single specimen taken from under the clytra of a Passalid from Brazil. He ascribed it to his genus *Passalobia* and regarded it as a male. Actually his figures show clearly that it is a nymph and this is confirmed from an examination of the specimen itself which Prof. Lombardini has very kindly loaned to me and permitted me to remount for critical study.

D. similis was described by Trägårdh also from a single nymph from a Passalid, *Proculus goryi* from Mexico in the Hope Museum at Oxford. Unfortunately, it has not been possible to trace Trägårdh's slide of this specimen, either in the Trägårdh material in the Stockholm Museum, or in the Hope Museum, to which it was supposed to have been returned. It must therefore be presumed to have been lost.

However, in addition to being able to examine Lombardini's type, I possess a single nymph collected by myself from a Passalid, at Annapolis, Maryland, U.S.A., in 1949, and amongst a number of slides of *Diarthrophallus quercus* (Pearse *et al.*) sent to me by Dr. D. E. Johnston of the University of Maryland, was one of nymphs, all of which agree with Trägårdh's and Lombardini's species thus establishing the synonymy of *similis* with *duodecimpilosa*. In his descrip-

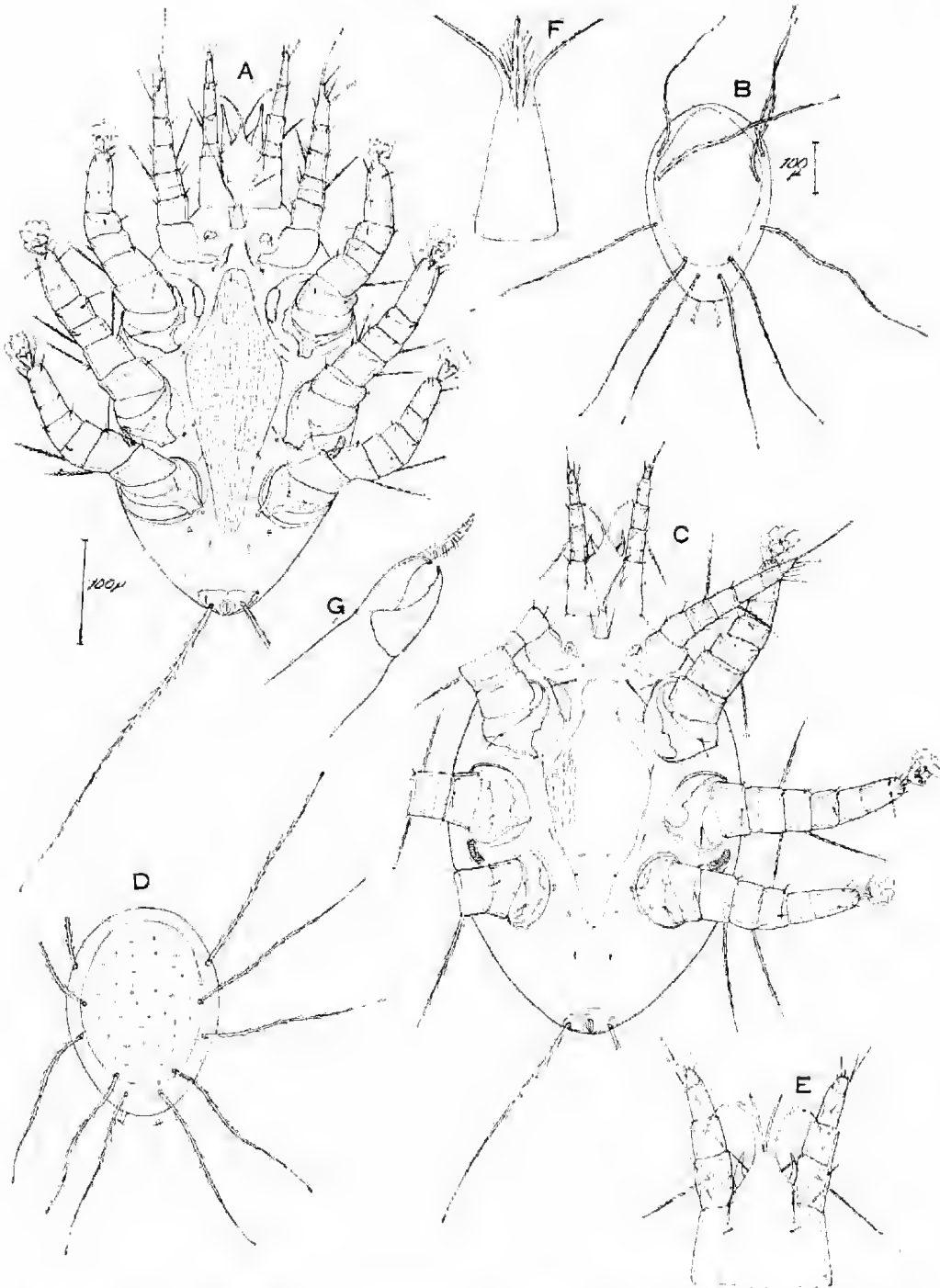


Fig. 3.—*Diarthrophallus duodecimpilosa* (Lomb., 1938). Nymph: A, venter; B, dorsum (A-B from Lombardini's type); C, venter; D, dorsum; E, gnathosoma from below; F, tectum; G, chelicerae (C-G from specimen 1-241-6, from Michigan, U.S.A.).

tion Trägårdh described the tectum (*sic* epistome) as having a triangular mucro with a very fine fringe and figures it so (Fig. 7C). In this Trägårdh was mistaken, for in all three specimens before me the tectum is conical with a quadrifurcate apex as in most species of *Diarthrophallinae*; the outer members are strong and angled, and the inner straight, but with long basal ciliations. It is these ciliations which Trägårdh saw and interpreted as the fringe of a triangular tectum.

The species is principally characterised by having only 5 pairs of long dorsal setae, but whether it should be strictly placed in *Diarthrophallus* or the allied genus *Brachytremella* Trägårdh, must await the discovery of the adult female. For the present it is as well to retain Trägårdh's placing.

Redescription of Holotype. Fig. 3A-B.

Nymph.—Length of idiosoma 384μ , width 240μ . Shape broadly oval.

Dorsum.—With entire dorsal shield not completely covering dorsum as figured; with five pairs of long ciliated slender capitate setae of approximately equal length from 336μ to 408μ ; shield 312μ long by 230μ wide.

Venter as figured, with the median shield 254μ long by 96μ , widest between coxae II and III, the shield is furnished with short broken elongate markings and carries a pair of marginal pores in line with front of coxae II and another pair in line with anterior of coxae IV, of the 5 pairs of ventral setae only the fourth pair are on the shield and marginal; only the endopodal shields of coxae II and IV are well sclerotised, those of II being somewhat kidney-shaped as shown, 38μ long by 14μ wide and do not tend to contour the coxae as in other species, those of coxae IV contour the coxae normally; the anal shield is roughly triangular and furnished with a pair of long setae, 336μ , similar to the dorsal setae; peritreme small, 29μ long.

Gnathosoma similar to that of other species as are also the palpi. *Chelicerae* as figured, movable digit with a small median tooth, fixed digit with subapical excrescence; tectum as figured, quadrifurcate, the outer members strongly angled outwards, the inner straight, closely adjacent.

Legs as in *D. quercus* (Pearse *et al.*), the coxae of leg I not conjoined medially, but distinct and fragmented. I 182μ long, II-IV 240μ .

Remarks.—The accompanying figures of this specimen are drawn after remounting. For comparison figures and details of a specimen from Michigan (one of three) are given as well as measurements of the specimen collected by myself at Annapolis.

Specimen from Oaklands Co., Michigan, U.S.A. (one of three labelled *Diarthrophallus quercus*) coll. D. E. Johnston, 24th April, 1957. No. I-241-6. Length of idiosoma 359μ , width 307μ . Dorsal shield 317μ long by 245μ wide. Dorsal setae 5 pairs to 384μ long. Ventral shield 245μ long, maximum width 96μ ; endopodal shields of coxae I 48μ by 14μ ; peritreme 24μ long. Anal setae 264μ long.

Specimen from Annapolis, Maryland, U.S.A., June, 1947 (coll. H.W.). Length of idiosoma 442μ , width 350μ . Dorsal shield 336μ long by 230μ wide. Dorsal setae, 5 pairs to 384μ long. Ventral shield 254μ by 100μ maximum width; endopodal shields of coxae I 48μ by 14μ ; peritreme 29μ long. Anal setae?

GENUS BRACHYTREMELLA Trägårdh, 1946.

Trägårdh, I., 1946. Ent. Medd., 24 (6), p. 386.

This genus was erected by Trägårdh for a single female obtained from a Passalid *Protomocerus* sp. from New Guinea. He distinguished the genus on the fact that the perigenital ring was open posteriorly with the sterno-gynial

shield completely coalesced with the ventral and not closed by a semicircular suture as in *Diarthrophallus*. The genus has been redefined and the genotype redescribed from freshly discovered material in the concurrent paper.¹

Besides the above difference from *Diarthrophallus* there is a significant one in the form of the tectum. In the two known species of *Diarthrophallus* the tectum is apically quadrifurcate with the outer elements bent angularly outwards and simple, the inner elements but little shorter directed straight forwards, closely adjacent to each other and with long ciliations basally; in *Brachytremella* the tectum is quadrifurcate in *B. spinosa* Träg. and *B. trägårdhi* Wom., 1960 (this Journal, p. 11), with the outer elements shorter and stouter than the inner and slightly curved outwards, the inner elements arise well within the basal junction of the outer ones, are much longer, simple and divergent. In *B. bornemisszai* Wom., 1960 (this Journal, p. 20), the tectum is only bifurcate apically with two long slender simple elements.

The above three species placed in the genus are separated as in the following key to subfamilies, genera and species of Diarthrophallidae.

Brachytremella spinosa Träg.

Trägårdh, I., 1946. Ent. Medd., 24 (6), p. 385, fig. 8.

Womersley, H., 1960. Some Acarina from Australia and New Guinea, paraphagic upon millipedes and cockroaches and on beetles of the family Passalidae. Pt. 4. The family Diarthrophallidae. This Journal, p. 13, figs. 1 and 2.

The type specimen of this species described from New Guinea from *Protomocerus* sp. has apparently been lost. The species was redescribed (Womersley, this Journal, p. ??) in the concurrent paper from fresh material of both sexes and the tritonymph, from a Passalid from Bulolo, New Guinea, Aug., 1954 (coll. H.W.).

Brachytremella trägårdhi Wom.

Womersley, H., 1960. *Ibid.*, this Journal, p. 16, figs. 3 and 4.

This species was described from the female, tritonymph and deutonymph from specimens from Passalids (*Mastochilus* sp.), from Mt. Lamington, Queensland, collected in December, 1948 (H.W.).

Brachytremella bornemisszai Wom.

Womersley, H., 1960. *Ibid.*, this Journal, p. 20, fig. 5.

Only the tritonymph of this species is known. It was described from two specimens found on *Aulacocyclus edentulus* McL., Hinchinbrook Is., North Queensland, 9/9/56 (coll. G.F.B.), and on the same host from Wilson's Downfall, near Teunterfield, New South Wales, 8/10/56 (coll. G.F.B.).

Genus *PASSALOBIA* Lombardini.

Lombardini, G., 1926. Duo nova genera acarorum. Boll. Soc. entom. ital., 63 (9-10), p. 158, figs. 1-2.

Lombardini erected this genus for a new species *Passalobia quadricaudata* found under the elytra of a Passalid beetle from Brazil. His generic diagnosis was very brief and inadequate and merely stated that it belonged to the Laelaptidae, that the sexes differed in some secondary characters and that the tarsi of leg I lacked ambulacra.

¹ Some Acarina from Australia and New Guinea paraphagic upon millipedes and cockroaches and on beetles of the family Passalidae. Pt. 4. The family Diarthrophallidae. Womersley, H., 1960. This Journal, p. 11.

Since his original diagnosis of the genus and description of the type species Lombardini has described three other species which he assigned to his genus. These were *duodecimpilosa* 1938, Mem. Soc. ent. ital., 17 (1), p. 44, figs. V and VI; *major*, 1938, *ibid.*, pp. 118-120, fig. II; *peritrematica*, 1951, Redia 36: 245-7, fig. 1.

In his original description of *quadricaudata* he figures the female and what he then considered to be the male, but in 1943, in *F.Agricoltura Coloniale*, 37 (3), pp. 3-6, figs. 1 and 2, he described a true male which he ascribed to *quadricaudata* and concluded that his original figure and description of the male were those of the nymph. In the same paper he described and figured a larva as of this species.

Apart from the above species, no others have been described or met with, nor has further material been reported by other workers. The first reference to the genus, however, by other workers appears to be that of Trägårdh, 1946, in his important paper on the Diarthrophallidae, when he placed *Passalobia* in association with his genera *Diarthrophallus* and *Brachytremella*, mainly on the structure of the genital shield of the female in that family. Trägårdh himself came to the conclusion that Lombardini's male of 1926 was a nymph, but as he apparently had only Lombardini's 1926 paper before him, he was unaware that Lombardini himself had earlier corrected this while at the same time describing a true male. Trägårdh, 1946: 394, in a key to the genera of the Diarthrophallidae, separates *Passalobia* from *Diarthrophallus* and *Brachytremella* on the presence of a constriction of the body posterior of coxae IV. This feature apparently was not considered as generic by Lombardini, but it is one of several mentioned in the original description of *quadricaudata* which may be so regarded.

Owing to the uncertainty of the status of *Passalobia* the writer requested the loan of Lombardini's original material, and I have been privileged to be able to study what is now extant of this, for which I am truly grateful to my colleague. I have received from Prof. Lombardini 6 slides, (1) the unique male and the larva of *quadricaudata* described by him in 1951, (2) the unique specimen of *duodecimpilosa*, (3) two nymphs of *major*, one of which agrees with his figure, and (4) one of the two recorded specimens of *peritrematica*. These are all the material which now exists, the remainder including the original female and nymph of *quadricaudata* having, I am informed, been lost in the war.

With Prof. Lombardini's permission I have been able to remount these specimens and they are redescribed and figured in this paper.

Of these, it is now shown that except in *duodecimpilosa* and *peritrematica*, the constriction behind coxae IV is present in both the female, male and nymph of *quadricaudata* and in the nymph (the only stage known) of *major*. *P. duodecimpilosa* is shown to be synonymous with and to have priority over *Brachytremella similis* Träg., 1946. Thus it must be removed from *Passalobia*. Lombardini's *peritrematica* is a most interesting form and a new genus, *Passalana*, is erected for it. Thus the only two species to remain in *Passalobia* are the genotype *quadricaudata*, and *major*. Of all these four species, except *duodecimpilosa*, however, there is one character by which they differ from the other genera of the Diarthrophallidae, namely, the tectum is a short conical helmet shape with an apical spine, it does not terminate in four or two branches. The original female and nymph of *quadricaudata* are now presumably lost. The male attributed by Lombardini to *quadricaudata* is here redescribed. If the correlation is correct, and at present I see no reason to disagree, then the characteristic enlarged and armoured second leg in this sex can be considered as generic for *Passalobia*. There is, however, one very remarkable feature by which it differs

from all other species of Diarthrophallidae so far known. The stigmatic opening instead of lying between coxae III and IV is placed between coxae II and III as figured and is apparently more dorso-lateral than ventro-lateral. Although Lombardini does not mention the stigmata in his description, the position between coxae II and III is clearly indicated in his figure.

The slide containing the larvae described by Lombardini, showed that his figure was probably correct, although when received the specimen was in poor condition. Unfortunately, however, this specimen was lost in remounting. It is clear, however, from what was seen of the specimen before it was lost, and from Lombardini's figure 3, that it is not the larva of a Diarthrophallid. The

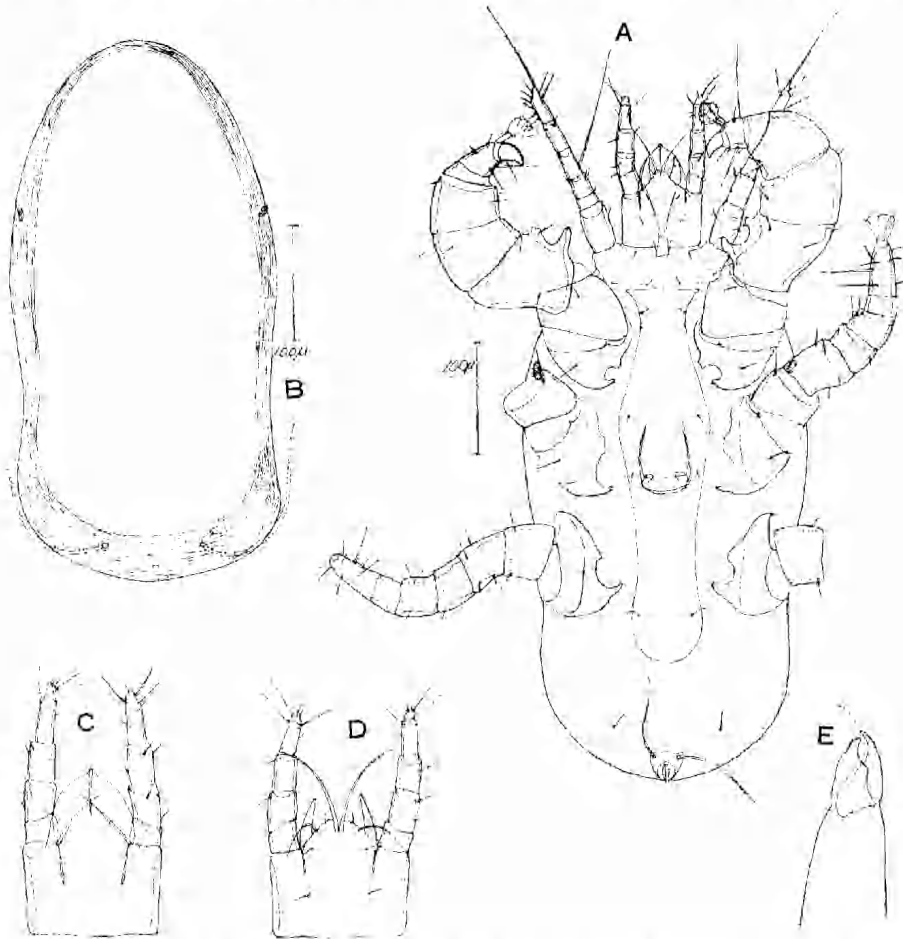


Fig. 4.—*Passalobia quadricaudata* Lomb. Male: A, venter; B, dorsum; C, gnathosoma from above showing tectum; D, gnathosoma from below; E, chelicerae.

number of dorsal setae, the formation of the gnathosoma and the legs, especially the tarsi with the ambulacra bearing two claws on all legs clearly separate it. At present, however, I would not venture to place it.

Passalobia major agrees with all the characters of generic value shown in the nymph of *quadricaudata* as figured and described by Lombardini and although only known from the nymph is probably a good and valid species.

Passalobia peritrematica, however, is a very striking creature. The body is not constricted behind coxae IV as in *P. quadricaudata* and *P. major* but tapers posterior of coxae IV to a rounded end and thus is somewhat obovate in shape. The most striking feature is that while the stigmal opening although small is between coxae III and IV, the peritremes are long, rather wide lobe-like structures with indistinct chambers and are directed posteriorly and free of the body. As Lombardini remarks, this is a unique feature in the Acarina. In the tectum the species agree with *Passalobia*. A new genus *Passalana* is erected for it.

On the structure of the tectum the two genera *Passalobia* Lomb. (genotype *P. quadricaudata* Lomb.) and *Passalana* g. nov. (genotype *P. peritrematica* (Lomb.)) are placed in a separate and new subfamily of the Diarthrophallidae, the Passalobiinae.

The genus *Passalobia* may now be more adequately diagnosed as follows:

Diarthrophallidae, with the body and dorsal shield, more or less, constricted medially posterior of coxae IV and furnished with only one pair of long anteriorly curved simple setae subposteriorly; tectum a short rounded cone with apical spike, helmet-like; stigma between coxae III and IV (♀) or between coxae II and III (♂), coxae I coalesced to form a transverse shield; ventral shield in nymph extending well past coxae IV. In the male, leg II is very much stouter than III or IV and armed with strong apophyses on femur and a strong claw-like spur ventrally and subapically on tarsus.

Type *P. quadricaudata* Lomb., 1926.

Passalobia quadricaudata Lomb.

Fig. 4A-E.

Passalobia quadricaudata Lombardini, 1926, Bull. Soc. entom. ital., 63 (9-10), p. 158, figs. 1-2 (nymph and ♀); 1943, l'Agricoltura Coloniale, No. 3, pp. 3-5, figs. 1-2 (♂).

Passalobia tetracaudata Lomb., 1938, Mem. Soc. entom. ital., 17 (1), p. 46 (a *lapsus calami* for *quadricaudata*): 1938, *ibid.*, 17 (1), p. 120 (a similar *lapsus calami*).

Passalobia quadricaudata, Träg., 1946, Ent. Medd., 24 (6), p. 38. (N.B.—Legend under fig. 9 copied from Lombardini, 1926, reads "*quadricornuta*" in error.)

No material of the female and nymph now being available the following redescriptions of these stages is drawn up from a careful consideration of Lombardini's descriptions and his excellent figures of 1926. For the male I have been able to study the unique specimen.

Female.—Body form bilobed with a distinct constriction just behind coxae IV; approximate length 500 μ , width 250 μ .

Dorsum with a single dorsal shield which anteriorly completely covers dorsum, with one pair of long simple forwardly curved setae subposteriorly.

Venter.—Tritosternum with basal cone flanked by a pair of setae, with a pair of long laciniae; sternal, endopodal, metasternal and ventral shields coalesced, expanding widely behind coxae IV to occupy almost all the ventral surface with rounded margin, with 5 pairs of setae, the anterior pair, sternal setae I, not much if at all longer than II, setae II-IV between the second and third pairs of coxae, V subposterior on the ventral portion of shield; in the intercoxal portion is the large oval perigenital ring which is open posteriorly, its anterior is in line with the middle of coxae II and the sides extend to beyond coxae IV, at its open posterior end the sternogynial shield which is the same shape and occupies the whole of the perigenital ring is fused with the ventral shield; the stigma is small and placed between coxae III and IV and has no peritreme.

Gnathosoma.—No hypostomal setae are shown on Lombardini's figure, but doubtless there are the usual 3 pairs; tectum a short cone with rounded sides and an apical spike, helmet-like; *palpi* 5-segmented, tapering.

Legs as in other Diarthrophallids, generally directed forwards, shorter than body, I tapering, tarsi without ambulacra and apically bifid, with a long apical seta (shown in Lombardini's fig. 11 as arising from the tibia), II-IV stouter and somewhat longer than I, tarsi with large pad-like ambulacra but no claws, leg setae minute and sparse, without any long setae on femur or genu and only a few moderately long setae subapically on tarsi.

Male lectotype, Fig. 4A-E.—Of rather elongate shape with slight constriction posterior of coxae IV. Length of idiosoma 480μ , width 240μ .

Dorsum.—With single dorsal shield 442μ long by 220μ wide anteriorly, surrounded by a narrow band of striated cuticle (Fig. 4B), one pair of long 160μ setae posterior of the shield.

Venter, Fig. 4A, as figured; tritosternum with conical base flanked by a pair of setae and with paired lacinae; sternal, endopodal, metasternal and ventral shields coalesced to an elongated shield extending well beyond coxae IV but still widely separated from anal shield, with 4 pairs of short setae, the anterior pair somewhat behind anterior margin, the shield is 336μ long and 120μ wide between coxae III and 110μ wide posterior of coxae IV, in the intercoxal portion lies the perigenital ring 67μ long and 43μ wide, containing the backwardly directed, double-segmented sternogynial shield 63μ long by 38μ wide with the anterior part 48μ long, the sternogynial shield is fused anteriorly with the sternal portion; between the ventral shield and the anal is a pair of short wider spaced setae; anal shield small, triangular, 28μ wide by 28μ long with adanal setae 96μ long; stigma situated between coxae II and III and apparently more dorsal than ventral, without peritreme.

Gnathosoma, Fig. 4C, D; with 3 pairs of hypostomal setae, the anterior pair much longer than the others, and with paired styli; dorsally with helmet-shaped tectum, labial cornicles moderately long; *palpi* 5-segmented, without any long setae on femur or genu; *chelicerae*, Fig. 4E, with short edentate chelae, the fixed digit with subapical hyaline excrescence.

Legs.—Six-segmented, I slender and much shorter than the rest, 192μ , without ambulacra or claws, tapering, genu with a very long simple seta, tarsus apically bifid with a long terminal seta, coxae coalesced to form a single transverse shield, II very stout, much more so than III or IV and armed on femur with a strong inner process and a smaller one subapically, tarsus with ambulacra of a large pad but no claws, subapically with a strong claw-like spur, length of leg 336μ , width of femur 72μ ; III and IV thicker than I, 288μ long, without any long setae except on tarsi when they are only of medium length, tarsi with large ambulacra but no claws.

Remarks.—The male is a remarkable creature and should the correlation of it with the female described earlier by Lombardini be correct, then the character of the enlarged and armoured leg II can be considered a generic character. Another remarkable feature is that the stigma, normally between coxae III and IV in the female, is in the male placed between coxae II and III as is clearly indicated in Lombardini's original figure. The rediscovery of the species in both sexes is badly needed to verify the above features and check the correlation.

In his 1943 paper Lombardini also described and figured (Fig. 3) what he regarded as the larva of *quadricaudata*. Amongst the slides sent to me by Dr. Lombardini was that of this specimen. Although in bad condition, it could be seen that Lombardini's figure was a reasonably good one. Very regrettably, however, in an attempt to remount this specimen it became lost.

From what was seen of the specimen and from Lombardini's figure and description, it seems pretty conclusive that on the structure of the ambulacra which consisted of a longish caruncle with only a small pad and paired claws on all tarsi, as well as the body setae, it is not a Diarthrophallid and probably does not belong to the Uropodina. Until rediscovered little more can be said.

Passalobia major Lomb., 1938.

Fig. 5.

Lombardini, G., 1938. Mem. Soc. entom. ital., 17 (1), p. 120, fig. II.

This species was described from the nymph only, from under the elytra of Passalids from Brazil. Amongst the slides sent to me by Dr. Lombardini were two nymphs of this species, one of which in good condition appears to be

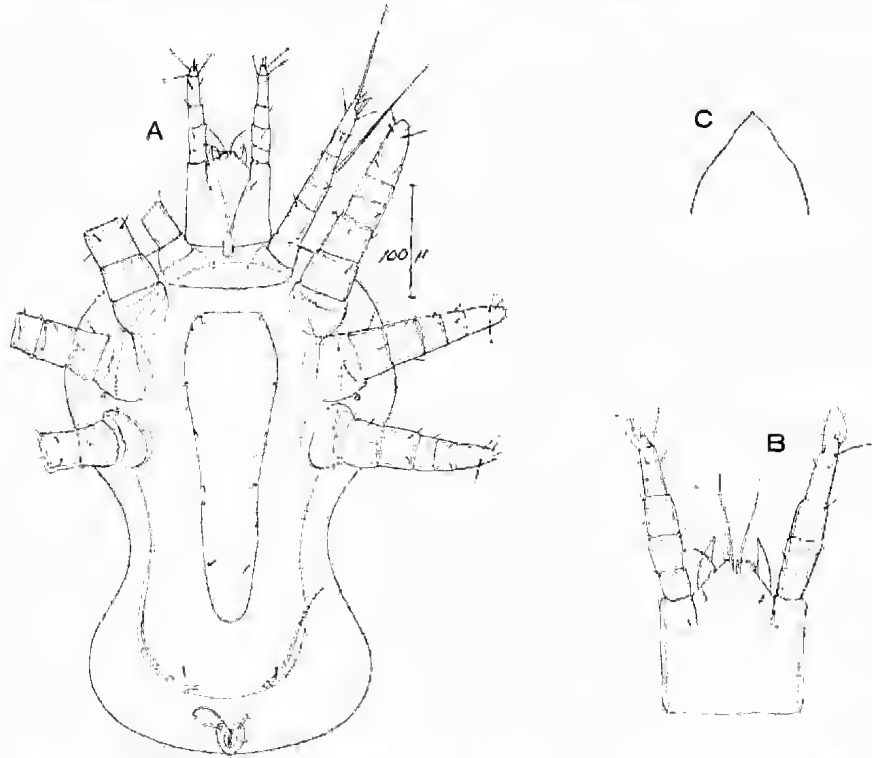


Fig. 5.—*Passalobia major* Lomb., 1938. Nymph: A, venter; B, gnathosoma from below; C, tectum.

that figured by Lombardini. It differs slightly, however, in the shape of the ventral shield and is refigured and redescribed as follows:

Tritonymph.—Body of elongate bilobed form with a strong constriction behind coxae IV, length of idiosoma 480μ , anterior portion 298μ wide, posterior portion 187μ wide and across the constriction 115μ .

Dorsum, Fig. 5A.—Dorsal shield entire, roughly contouring the body shape 360μ long by 206μ wide, posteriorly with a pair of submarginal long setae 67μ apart and 115μ long and directed forwards.

Venter, Fig. 5A.—Tritosternum with paired laciniae and flanked by a pair of setae; with a single elongated shield 240μ long and 94μ at the widest part between coxae III, extending well past coxae IV but not nearly reaching anal

shield, with 5 pairs of small setae; endopodal shields not marked; anal shield small, triangular, 24μ wide by 24μ long with a pair of forwardly directed setae 57μ long.

Cnathosoma, Fig. 5B, with three pairs of hypostomal setae, the anterior pair much the longest, with long salivary styli, dorsally with helmet-shaped tectum, Fig. 5C; *palpi* 5-segmented, without long setae on femur or genu Fig. 5B; *chelicerae* not clearly seen.

Legs.—I the shortest and slender, 192μ long with a long seta on genu, tarsus apically bifid with a long terminal seta but without ambulacram, coxae coalesced to form a single transverse shield; II-IV stouter, 216μ long, without any long setae; tarsi with pad-like ambulacra but no claws.

Remarks.—This would seem to be a valid species, differing from the nymph of *quadricaudata* Lomb. figured as a male by him (1926), in the shorter ventral shield and in the shorter dorsal and anal setae.

GENUS *PASSALANA* NOV.

This genus is erected for the very curious species described in 1951 by Lombardini under the name of *Passalobia peritrematica*. The genus may be diagnosed as follows:

Diarthrophallidae in that legs I are antennaeform without ambulacra or claws and with the tarsus apically bifid with long terminal seta; legs II-IV stouter than I with large ambulacra but no claws; body shape obovate with a single dorsal shield, with only one pair of long dorsal setae sub-posteriorly on cuticle between dorsal shield and end of body; sternal shield extending only slightly beyond coxae IV and into the angles between coxae II and III, and between coxae III and IV; ventri-anal shield large with a pair of small sub-anterior setae and a pair of long adanal setae; stigma between coxae III and IV with long tubular blunt-ended peritreme with a number of indistinct chambers and extending backwards and free of the body almost to the end of it; coxae of leg I coalesced; tectum helmet-shaped. Type *Passalobia peritrematica* Lomb.

The unique specimen is redescribed thus:

Passalana peritrematica (Lomb.).

Lombardini, G., 1951. Redia 36, 2nd ser., pp. 245-247, fig. 1.

Of this species Lombardini states that he had found only two females from under the elytra of Passalid beetles from Brazil.

It is clear from his figure, however, as well as from the single specimen now extant and amongst the slides he sent me, that the specimens are not adult in that there is no sign of the genital organs. True there is a peculiar large ring with crenulate margin lying between the third and fourth coxae which might suggest on superficial examination an ovum in situ; that it is not so, is evident from the absence of genitalia and the fact that it appears to be on the dorsal surface. Until fresh material can be examined the precise nature of this feature is problematical, but it is possibly a dorsal protuberance which in mounting has been depressed to give the ring-like appearance; the marginal crenulations do to some extent extend on to the surface from the margin inwards.

Nymph, Fig. 6A-C.—Shape of body obovate, idiosoma 328μ long by 199μ wide, widest part in line of coxae III.

Dorsum, Fig. 6B; with a single dorsal shield as shown, which is only separated from the margin of the body anteriorly and ends about midway between coxae IV and the anus, with only one pair of long simple setae marginally, which are 82μ apart, 53μ from the anus and 72μ long.

Venter, Fig. 6A.—Tritosternum with short conical base flanked by a pair of setae and with paired laciniae; with the sternal and endopodal shields coalesced, with almost straight anterior margin, 120μ , and strongly convex

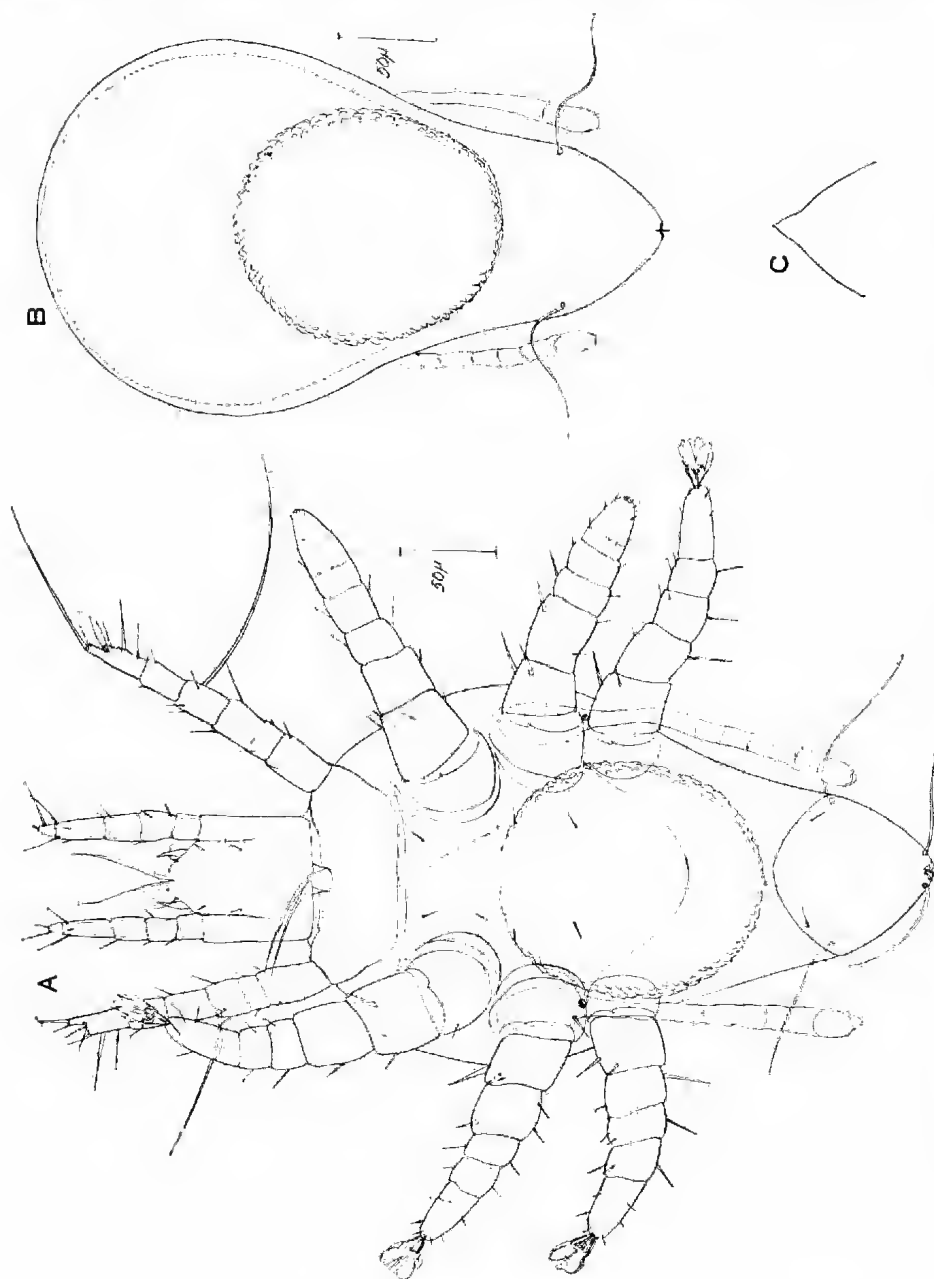


Fig. 6.—*Passalobia peritrematica* (Lomb., 1951). Nymph: A, venter; B, dorsum; C, tectum.

posterior margin extending to slightly beyond acetabula IV, length of shield 140μ , width between intercoxal angles 120μ , with 3 pairs of setae; anal shield large, apparently embracing the ventral, with strongly convex anterior margin and sides contouring the body margin, 72μ long, 82μ wide, with the anus and

adanal setae posterior, adanal setae simple and 96μ long, sub-anteriorly and about 50μ apart is a pair of short setae; stigma small and situated between coxae III and IV with a long, sausage-like chambered peritreme, 150μ long and ca. 12μ wide which lies free from the body and is directed backwards.

Gnathosoma with 3 pairs of hypostomal setae, the anterior pair much the longest, with a pair of long hypostomal styli; tectum helmet-like (Fig. 6C); palpi 5-segmented, without any very long setae; *chelicerae* not clearly seen.

Legs.—All 6-segmented, I the longest, 158μ , but not so stout as II-IV, antennaeform, without ambulacra or claws, tarsi apically bifid with a long apical seta, a very long nude seta on genu; legs II-IV stouter, with large ambulacra but no claws, without any long setae on any segments, II 216μ , III 178μ , IV 178μ ; coxae of leg I coalesced to form a transverse shield.

Remarks.—The curious ring structure noticed above is 110μ in diameter.

Key to the Subfamilies, Genera and Species of the *Diarthrophallidae*.

1. Tectum bi- or quadrifurcate; dorsum generally with some long ciliated capitate setae 2
 - Subfam. *Diarthrophallinae* Träg.
Tectum helmet-like with apical spike, not bi- or quadrifurcate; dorsum with only one pair of sub-posterior long simple setae. 5
 - Subfam. *Passalobiinae* nov.
2. Of broadly oval body form, with some long ciliated capitate dorsal setae. 3
 - Of elongate form, without any dorsal long setae. Ventral shield reaching to the anal, with longitudinal lines. Tectum bifurcate. 3
 - Gen. *Brachytremelloides* nov.
B. striata Wom., 1960.
3. Genital orifice of female closed behind by a semicircular suture; coxae of leg I not coalesced, fragmented. Tectum quadrifurcate, with inner elements ciliated basally. 4
 - Gen. *Diarthrophallus* Träg., 1946.
 - (a) With 6 pairs of long dorsal setae. 4
 - D. quercus* (Pearse et al., 1936).
 - (b) With 5 pairs of long dorsal setae. 4
 - D. duodecimpilosa* (Lomb., 1938),
= *similis* Träg., 1946.
4. Genital orifice open behind, genital shield coalesced with ventral. 4
 - Metapodal shields present, large and not coalesced with ventral. Tectum bifurcate. Dorsum with only 3 pairs of long setae posteriorly. 4
 - Gen. *Lombardiniella* nov.
L. lombardini Wom., 1960.
 - Metapodal shields absent or fused with ventral. Tectum bi- or quadrifurcate. Dorsum with more than 3 pairs of long setae, not confined to the posterior. 4
 - Gen. *Brachytremella* Träg., 1946.
 - (a) With 6 pairs of long dorsal setae of which the second pair from the front are only half the length of the others. Tectum quadrifurcate with the inner elements the longest. 4
 - B. trågårdhi* Wom., 1960.
 - With all the dorsal setae equally long (b)
 - (b) With 5 pairs of long dorsal setae. Tectum quadrifurcate with the inner elements the longest. 4
 - B. spinosa* Träg., 1946.
 - With 4 pairs of long dorsal setae. Tectum bifurcate. 4
 - B. bornemisszai* Wom., 1960.

5. Body constricted more or less behind coxae IV then widening.
Gen. Passalobia Lomb., 1926.
- (a) In nymph with ventral shield although surpassing coxae IV not nearly reaching anal; adanal setae much shorter than dorsal.
P. major Lomb., 1938.
- (b) In nymph with ventral shield nearly reaching anal; adanal setae as long as dorsal setae. In male leg II with femoral apophyses and subapical tarsal spur, and stigma between coxae II and III.
P. quadricaudata Lomb., 1926.
- Body form obovate, tapering from coxae IV; with backwardly directed long and free, chambered peritremes. Tectum bifurcate. (Only known from nymph.)
Gen. Passalana nov.
P. peritrematica (Lomb., 1951).

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